

Claims

- 1 1. A seat belt system comprising:
2 a cable assembly comprising a flexible cable having a first
3 and a second end, one of the first and second end connectable to a
4 first mechanism and the other of the first and second end connectable
5 to a second mechanism, the cable comprising at least a single strand
6 or formed of a plurality of adjacent strands, the configuration of the
7 wire forming intra-wire spaces between adjacent ones of the wires and
8 the assembly including an easily melted alloy or resin fill material filling
9 the intra-wire spaces, the fill material changes the amount of energy
10 needed to bend the cable in comparison to a cable having no fill
11 material within the intra-wire spaces.
- 1 2. The system as defined in Claim 1 wherein the first mechanism
2 to which the cable is connected is one of an anchor and a piston
3 associated with a pretensioner and the second mechanism to which
4 the cable is connected is one of a buckle and a buckle-connecting
5 member.
- 1 3. The system as defined in Claim 1 wherein the fill material also
2 covers the exterior of the cable and is of determinable thickness.
- 1 4. The system as defined in Claim 3 wherein the thickness of the
2 fill material is variable and wherein the energy needed to bend the
3 cable varies with the thickness, resin or alloy of the fill material.
- 1 5. The system as defined in Claim 1 wherein the fill material
2 includes a molten solder.

- 1 6. The system as defined in Claim 1 wherein the fill material
2 includes one of an alloy of molten: lead, tin, silver, bismuth, copper,
3 antimony, selenium, resins or epoxies.

- 1 7. The system as defined in Claim 1 wherein the cable is
2 configured as a component of a buckle pretensioner, the pretensioner
3 including a curved path about which the cable is pulled, one end of the
4 cable extending from the pretensioner connected to a buckle, and
5 wherein the fill material is located at least between the curved path and
6 the buckle.

- 1 8. The system as defined in Claim 7 wherein the cable includes
2 multi-strand, multi-cable.

- 1 9. The system as defined in Claim 8 wherein the fill material fills
2 intra-wire as well as intra-strand spaces.

- 1 10. The system as defined in Claim 9 wherein the pretensioner
2 further includes a tubular housing and wherein an end of the cable is
3 connected to a piston movable within the housing to pull the cable
4 about the curved path.

- 1 11. A vehicle occupant restraint system, including:
2 a seat belt pretensioner comprising
3 a curved cable guide and a flexible cable, having a
4 determinable flexibility, the cable including stiffening means for
5 increasing the stiffness of a selected portion of the cable above the
6 determinable stiffness to enhance energy dissipating properties of the
7 cable when bent.

1 12. The system as defined in Claim 11 wherein the stiffening means
2 includes one of solder, resin or epoxy either of which is pliable within a
3 temperature range of -40 degrees F and 120 degrees F.

1 13. A vehicle occupant restraint system, including:
2 a seat belt pretensioner comprising
3 a curved cable guide;
4 a flexible cable disposed about the cable guide;
5 first means for moving the cable about the cable guide;
6 wherein the cable has a determinable flexibility and wherein the
7 cable includes energy dissipating means for dissipation of energy, the
8 energy dissipating means located adjacent wires or fibers of the cable,
9 and energy absorbing material configured to resist the bending of the
10 cable as the cable is forced to bend about the cable guide in response
11 to movement of the first means.

1 14. The system as defined in Claim 13 wherein the energy
2 dissipating means includes stiffening means for increasing the stiffness
3 of a selected portion of the cable above the determinable stiffness.

1 15. The system as defined in Claim 14 wherein the stiffening means
2 is a first material impregnated within a portion of the cable initially
3 positioned in the vicinity of the cable guide.

1 16. A method of making a flexible cable selectively more stiff, the
2 cable of the type comprising a plurality of small wires bundled or
3 twisted together with determinable spaces between portions of
4 adjacent wire, the method comprising the following steps:
5 a) providing a length of cable, the cable having a determinable
6 stiffness to bending;
7 b) impregnating a portion of the cable with a liquid material;

8 c) permitting the liquid material to solidify thereby increasing the
9 stiffness of the impregnated length of cable.

1 17. The method as defined in Claim 16 wherein the cable is metal
2 and wherein the liquid material is a molten solder.

1 18. The method as defined in Claim 16 wherein the cable is metal
2 and wherein the liquid material is one, or an alloy of molten tin, lead,
3 silver, bismuth, copper, antimony and selenium resins or epoxies.

1 19. The method as defined in Claim 16 wherein the step of
2 impregnating the cable includes dipping the cable in the liquid material.

1 20. The method as defined in Claim 16 wherein the step of
2 impregnating the cable includes spraying the liquid material onto the
3 cable and permitting the liquid to flow into the inter-wire spaces.

1 21. The method as defined in Claim 16 including the step of pre-
2 treating the cable prior to the step of impregnating.

1 22. The method as defined in Claim 16 wherein the step of pre-
2 treating includes the step of applying flux to the cable.

1 23. The method as defined in Claim 16 including the step of forming
2 the cable into a desired shape prior to impregnating.

1 24. A seat belt system comprising:
2 a seat belt buckle assembly, the assembly comprises: a
3 flexible wire cable subassembly having a first and a second end, one
4 of the first and second end connected to an anchor and the other of
5 the first and second end connected to a buckle, the wire cable

6 subassembly including a wire cable comprising a multi-wire strand of
7 these individual wires or threads and a solid material filling any intra-
8 wire spaces between adjacent wire or threads.

1 25. The system as defined in Claim 24 wherein the solid material, in
2 addition to filling any intra-wire spaces, also adheres to the adjacent
3 wires or threads.